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[54] **METHOD AND APPARATUS FOR DISCRIMINATING AND COUNTING DOCUMENTS**

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Related U.S. Application Data

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[51] **Int. Cl.^{6}** **G06K 9/00**

[52] **U.S. Cl.** 382/135; 209/546; 209/548

[58] **Field of Search** 382/135, 137; 209/534, 548, 551, 546; 250/556; 356/71

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[57] **ABSTRACT**

A currency counting and discrimination device for receiving a stack of currency bills, rapidly counting and discriminating the bills in the stack, and then re-stacking the bills. The device comprises an input receptacle for receiving a stack of currency bills to be discriminated, a discriminating unit for discriminating the denomination of the currency bills, and one or more output receptacles for receiving the currency bills after being discriminated by the discriminating unit. The device further comprises a transport mechanism for transporting the currency bills, one at a time, from the input receptacle past a sensor of the discriminating unit and to the one or more output receptacles. One or more counters keep track of the value of bills that are discriminated. Furthermore, means are provided for an operator of the device to indicate the value of any bills whose denomination are not determined by the discriminating unit; the bills whose denomination are not determined by the discriminating unit being termed no call bills. The value indicating means appropriately effects the one or more counters.

67 Claims, 81 Drawing Sheets
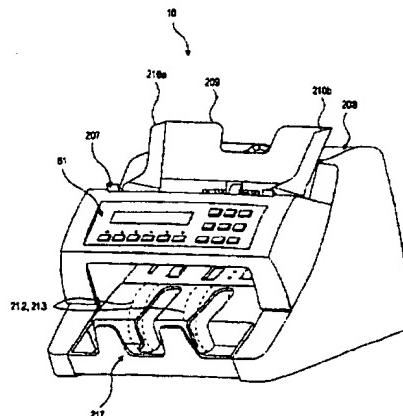
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Drawings of portions of Mosler CF–420 Cash Management System (FIGs. A–C) and description of the same (1989).

Alternatively, the discriminator may prompt the operator as to the denomination of each no call bill, for example, by employing one of the prompting methods discussed above, e.g., default, random, user-defined criteria, manufacturer defined criteria, prior bill information (last bill, last no call, last called denomination), historical information, scanned and master comparison information (e.g., highest correlation). For example, the discriminator may serially interrogate the examiner as to the denomination of each no call, for example, the display may initially query "Is 1st no call a $2?". Depending on the embodiment of the control panel being used, the operator could then select "ACCEPT" or "YES" or select the $2 denomination selection element, select "OTHER DENOM" or "NO" or use the scroll keys or select the appropriate denomination selection element, or if the operator finds the first bill unacceptable, the operator may put the first no call bill aside and select "CONT". The discriminator may then query the operator as to the denomination of the second no call bill, and so on. The denomination prompted to the operator would depend on the prompting criteria employed. For example, suppose the prompting criteria was the denomination of the preceding bill and further suppose that in the four no call example given above that the first bill was a $2, the 2nd bill was a $10, the 3rd bill was a $1, the 4th bill was a $1, the 19th bill was a $50, the 29th bill was a $10, and as stated above, the 30th bill was a $10. The discriminator would then prompt the operator as to whether the first no call was a $1. Since the first no call is a $2, the operator would choose "NO", "OTHER DENOM", scroll, or hit the $2 selection element depending on the embodiment be used. If the "NO" or "OTHER DENOM" key were pressed, the discriminator would review the preceding bills in reverse order and suggest the first denomination encountered that had not already been suggested, in this case a $10. If the "NO" or "OTHER DENOM" key were pressed again, the discriminator would then suggest a $2. A predetermined default sequence may be utilized when prior bill information does not contain the desired denomination. Once the operator indicates that the first no call is a $2, the discriminator would then prompt the operator as to whether the second no call was a $50. Since the second no call was indeed a $50 the operator would choose "ACCEPT", "YES", or select the $50 denomination selection element depending on the embodiment chosen. The discriminator would then suggest that the third no call was a $10 and the operator would similarly indicate acceptance of the $10 suggested denomination. Finally, the discriminator would suggest that the fourth no call was a $10. Since the last no call was a $2, the operator would reject the $10 suggestion and indicate that the fourth no call bill was a $2 as described above. The operation of the discriminator using a different prompting criteria would proceed in a similar manner and as described above with respect to each of the described prompting methods.

While discussed above with respect to no calls, the above embodiments could also be employed in connection with other types of flagged bills such as reverse-faced bills, reverse forward/reverse oriented bills, unfit bills, suspect bills, etc.

Referring now to FIG. 68, the touch screen I/O device 2956 includes a touch screen 2960 mounted over a graphics display 2961. In one embodiment, the display 2961 is a liquid crystal display (LCD) with backlighting. The display may have, for example, 128 vertical pixels and 256 horizontal pixels. The display 2961 contains a built-in character generator which permits the display 2961 to display text and numbers having font and size pre-defined by the manufac-

turer of the display. Moreover, a controller such as a CPU is programmed to permit the loading and display of custom fonts and shapes (e.g., key outlines) on the display 2961. The display 2961 is commercially available as Part No. GMF24012EBTW from Stanley Electric Company, Ltd., Equipment Export Section, of Tokyo, Japan.

The touch screen 2960 may be an X-Y matrix touch screen forming a matrix of touch responsive points. The touch screen 2960 includes two closely spaced but normally separated layers of optical grade polyester film each having a set of parallel transparent conductors. The sets of conductors in the two spaced polyester sheets are oriented at right angles to each other so when superimposed they form a grid. Along the outside edge of each polyester layer is a bus which interconnects the conductors supported on that layer. In this manner, electrical signals from the conductors are transmitted to the controller. When pressure from a finger or stylus is applied to the upper polyester layer, the set of conductors mounted to the upper layer is deflected downward into contact with the set of conductors mounted to the lower polyester layer. The contact between these sets of conductors acts as a mechanical closure of a switch element to complete an electrical circuit which is detected by the controller through the respective buses at the edges of the two polyester layers, thereby providing a means for detecting the X and Y coordinates of the switch closure. A matrix touch screen 2960 of the above type is commercially available from Dynapro Thin Film Products, Inc. of Milwaukee, Wis.

As illustrated in FIG. 68, the touch screen 2960 forms a matrix of ninety-six optically transparent switch elements having six columns and sixteen rows. The controller is programmed to divide the switch elements in each column into groups of three to form five switches in each column. Actuation of any one of the three switch elements forming a switch actuates the switch. The uppermost switch element in each column remains on its own and is unused.

Although the touch screen 2960 uses an X-Y matrix of optically transparent switches to detect the location of a touch, alternative types of touch screens may be substituted for the touch screen 2960. These alternative touch screens use such well-known techniques as crossed beams of infrared light, acoustic surface waves, capacitance sensing, and resistive membranes to detect the location of a touch. The structure and operation of the alternative touch screens are described and illustrated, for example, in U.S. Pat. Nos. 5,317,140, 5,297,030, 5,231,381, 5,198,976, 5,184,115, 5,105,186, 4,931,782, 4,928,094, 4,851,616, 4,811,004, 4,806,709, and 4,782,328, which are incorporated herein by reference.

We claim:

1. A currency counting and discrimination device for receiving a stack of currency bills, rapidly counting and discriminating the bills in the stack, and then re-stacking the bills comprising:

an input receptacle for receiving a stack of currency bills to be discriminated;

a discriminating unit for discriminating the denomination of said currency bills;

one or more output receptacles for receiving said currency bills after being discriminated by said discriminating unit;

a transport mechanism for transporting said currency bills, one at a time, from said input receptacle past a sensor of said discriminating unit and to said one or more output receptacles;

one or more counters keeping track of the value of bills discriminated;

value indicating means for an operator of said device to indicate the value of any bills whose denomination are not determined by said discriminating unit, said bills whose denomination are not determined by said discriminating unit being no call bills, said means appropriately effecting said one or more counters; and

a housing for said input receptacle, said discriminating unit, said one or more output receptacles, and said transport mechanism; wherein said value indicating means are affixed to said housing.

2. The discrimination device of claim 1 wherein said value indicating means comprise denomination selection elements.

3. The discrimination device of claim 1 having a single output receptacle.

4. The discrimination device of claim 1 having exactly two output receptacles.

5. A currency counting and discrimination device for receiving a stack of currency bills, rapidly counting and discriminating the bills in the stack, and then re-stacking the bills comprising:

an input receptacle for receiving a stack of currency bills to be discriminated;

a discriminating unit for discriminating the denomination of said currency bills;

one or more output receptacles for receiving said currency bills after being discriminated by said discriminating unit;

a transport mechanism for transporting said currency bills, one at a time, from said input receptacle past a sensor of said discriminating unit and to said one or more output receptacles;

one or more counters keeping track of the value of bills discriminated; and

value indicating means for an operator of said device to indicate the value of any bills whose denomination are not determined by said discriminating unit, said bills whose denomination are not determined by said discriminating unit being no call bills, said means appropriately effecting said one or more counters;

wherein the operation of said device is suspended when said discriminating unit is unable to identify the denomination of a bill.

6. The discrimination device of claim 5 having a single output receptacle and wherein the value of a no bill is added to appropriate ones of said one or more counters through the use of said value indicating means when the operation of said device is suspended and wherein the operation of the device is thereafter resumed.

7. The discrimination device of claim 6 wherein said value indicating means comprise denomination selection elements.

8. The discrimination device of claim 5 having exactly two output receptacles and wherein the value of a no bill is added to appropriate ones of said one or more counters through the use of said value indicating means when the operation of said device is suspended and wherein the operation of the device is thereafter resumed.

9. The discrimination device of claim 8 wherein said value indicating means comprise denomination selection elements.

10. The discrimination device of claim 5 comprising two or more output receptacles and wherein no call bills are delivered to a different one of said output receptacles than bills whose denominations are determined by said discriminating unit.

11. The discrimination device of claim 5 further comprising an inspection station and wherein no call bills are delivered to said inspection station.

12. The discrimination device of claim 1 comprising two or more output receptacles and wherein no call bills are delivered to a different one of said output receptacles than bills whose denominations are determined by said discriminating unit.

13. The discrimination device of claim 12 wherein the operation of said device is not suspended when a no call bill is encountered.

14. The discrimination device of claim 13 wherein the values of any no call bills are added to appropriate ones of said one or more counters through the use of said value indicating means after all the bills placed in said input receptacle have been processed.

15. The discrimination device of claim 14 having exactly two output receptacles.

16. The discrimination device of claim 14 wherein said value indicating means comprise denomination selection elements.

17. The discrimination device of claim 13 wherein the value of a no call bill may be added to appropriate ones of said one or more counters through the use of said value indicating means any time after said no call bill has been identified.

18. The discrimination device of claim 17 having exactly two output receptacles.

19. A currency counting and discrimination device for receiving a stack of currency bills, rapidly counting and discriminating the bills in the stack, and then re-stacking the bills comprising:

an input receptacle for receiving a stack of currency bills to be discriminated;

a discriminating unit for discriminating the denomination of said currency bills; one or more output receptacles for receiving said currency bills after being discriminated by said discriminating unit;

a transport mechanism for transporting said currency bills, one at a time, from said input receptacle past a sensor of said discriminating unit and to said one or more output receptacles;

one or more counters keeping track of the value of bills discriminated;

value indicating means for an operator of said device to indicate the value of any bills whose denomination are not determined by said discriminating unit, said bills whose denomination are not determined by said discriminating unit being no call bills, said means appropriately effecting said one or more counters; and

means for prompting an operator of the device as to the denomination of a no call bill.

20. The discrimination device of claim 19 wherein said value indicating means comprise denomination selection elements.

21. The discrimination device of claim 19 wherein said prompting means initially suggests that the denomination of a no call bill is the same as that of an immediately prior bill.

22. The discrimination device of claim 19 wherein said prompting means initially suggests that the denomination of a no call bill is the same as that of the last bill whose denomination was determined by said discriminating unit.

23. The discrimination device of claim 19 wherein said prompting means initially suggests that the denomination of a no call bill is the same as that of the last bill that was a no call bill.

24. The discrimination device of claim 19 wherein said discriminating unit determines the denomination of a bill by comparing a scanned data retrieved from said bill by said sensor with master data associated with one or more genuine bills and wherein said prompting means initially suggests that the denomination of a no call bill is the denomination associated with the master data that most closely matches the scanned data.

25. The discrimination device of claim 19 wherein said discriminating unit determines the denomination of a bill by comparing a scanned pattern retrieved from said bill by said sensor with one or more master patterns associated with one or more genuine bills and wherein said prompting means initially suggests that the denomination of a no call bill is the denomination associated with the master pattern that most closely matches the scanned pattern.

26. The discrimination device of claim 25 wherein said discriminating unit calculates a correlation number for each of said one or more master patterns based on said comparison between said scanned pattern and said one or more master patterns and wherein said prompting means initially suggests that the denomination of a no call bill is the denomination associated with the master pattern that has the highest correlation number.

27. The discrimination device of claim 19 further comprising means for permitting an operator of the device to select one or more denominations and their relative order to be suggested in connection with no call bills and wherein said prompting means suggests one or more denominations for a no call bill according to said selections made by said operator.

28. The discrimination device of claim 19 further comprising a memory for storing historical information regarding the denominations of previous no calls and wherein said prompting means suggests one or more denominations for a no call bill based on said historical information.

29. The discrimination device of claim 28 wherein said prompting means suggests one or more denominations for a no call bill based on the frequency of occurrence of no call bills for each of a plurality of denominations.

30. The discrimination device of claim 29 wherein said prompting means initially suggests the denomination that has had the highest frequency of no call bills.

31. A currency counting and discrimination device for receiving a stack of currency bills, rapidly counting and discriminating the bills in the stack, and then re-stacking the bills comprising:

    an input receptacle for receiving a stack of currency bills to be discriminated;

    a discriminating unit for discriminating the denomination of said currency bills;

    one or more output receptacles for receiving said currency bills after being discriminated by said discriminating unit;

    a transport mechanism for transporting said currency bills, one at a time, from said input receptacle past a sensor of said discriminating unit and to said one or more output receptacles;

    one or more counters keeping track of the value of bills discriminated;

    means for flagging bills meeting or failing to meet to predetermined criteria;

    value indicating means for an operator of said device to indicate the value of any flagged bills, said means appropriately effecting said one or more counters; and

    a housing for said input receptacle, said discriminating unit, said one or more output receptacles, and said

transport mechanism; wherein said value indicating means are affixed to said housing.

32. The discrimination device of claim 31 having a single output receptacle.

33. The discrimination device of claim 31 comprising two or more output receptacles and wherein no call bills are delivered to a different one of said output receptacles than bills whose denominations are determined by said discriminating unit.

34. The discrimination device of claim 33 wherein the operation of said device is not suspended when a no call bill is encountered.

35. The discrimination device of claim 34 wherein the values of any no call bills are added to appropriate ones of said one or more counters through the use of said value indicating means after all the bills placed in said input receptacle have been processed.

36. The discrimination device of claim 34 wherein said means for flagging flags a suspect bill by suspending the operation of said counting and discrimination device.

37. The discrimination device of claim 31 having exactly two output receptacles.

38. A currency counting and discrimination device for receiving a stack of currency bills, rapidly counting and discriminating the bills in the stack, and then re-stacking the bills comprising:

    an input receptacle for receiving a stack of currency bills to be discriminated;

    a discriminating unit for discriminating the denomination of said currency bills;

    one or more output receptacles for receiving said currency bills after being discriminated by said discriminating unit;

    a transport mechanism for transporting said currency bills, one at a time, from said input receptacle past a sensor of said discriminating unit and to said one or more output receptacles;

    one or more counters keeping track of the value of bills discriminated;

    means for flagging bills meeting or failing to meet to predetermined criteria;

    value indicating means for an operator of said device to indicate the value of any flagged bills, said means appropriately effecting said one or more counters; and

    an inspection station and wherein no call bills are delivered to said inspection station.

39. A currency counting and discrimination device for receiving a stack of currency bills, rapidly counting and discriminating the bills in the stack, and then re-stacking the bills comprising:

    an input receptacle for receiving a stack of currency bills to be discriminated;

    a discriminating unit for discriminating the denomination of said currency bills;

    one or more output receptacles for receiving said currency bills after being discriminated by said discriminating unit;

    a transport mechanism for transporting said currency bills, one at a time, from said input receptacle past a sensor of said discriminating unit and to said one or more output receptacles;

    one or more counters keeping track of the value of bills discriminated;

    means for flagging bills meeting or failing to meet to predetermined criteria; and

value indicating means for an operator of said device to indicate the value of any flagged bills, said means appropriately effecting said one or more counters;

wherein said predetermined criteria is said discriminating unit identifying the denomination of a bill and wherein said flagging means flags a bill failing to be identified by said discrimination unit by suspending the operation of said counting and discrimination device, said device being halted so that said flagged bill is located at a predetermined position within said discrimination device when said transport mechanism stops.

40. The discrimination device of claim 39 having a single output receptacle and wherein the value of a no bill is added to appropriate ones of said one or more counters through the use of said value indicating means when the operation of said device is suspended and wherein the operation of the device is thereafter resumed.

41. The discrimination device of claim 39 having exactly two output receptacles and wherein the value of a no bill is added to appropriate ones of said one or more counters through the use of said value indicating means when the operation of said device is suspended and wherein the operation of the device is thereafter resumed.

42. The discrimination device of claim 39 comprising two or more output receptacles and wherein no call bills are delivered to a different one of said output receptacles than bills whose denominations are determined by said discriminating unit.

43. A currency counting and discrimination device for receiving a stack of currency bills, rapidly counting and discriminating the bills in the stack, and then re-stacking the bills comprising:

an input receptacle for receiving a stack of currency bills to be discriminated;

a discriminating unit for discriminating said currency bills based on a predetermined criteria, said discriminating unit determining the denominations of said currency bills;

one or more output receptacles for receiving said currency bills after being discriminated by said discriminating unit;

a transport mechanism for transporting said currency bills, one at a time, from said input receptacle passed said discriminating unit and to one of said one or more output receptacles;

either (a) one or more denomination counters associated with one or more denominations; each counter keeping track of the number of discriminated bills belonging to the associated denomination as determined by said discrimination unit; or

(b) a total value counter maintaining the total value of said bills as they are discriminated by said discrimination unit; or

(c) both one or more denomination counters and a total value counter;

wherein a bill is flagged when it fails to satisfy said predetermined criteria or when said discriminating unit fails to identify said predetermined criteria for a bill, the operation of said counting and discrimination device being suspended when a bill is flagged, said device being halted so that said flagged bill is located at a predetermined position within said discrimination device when said transport mechanism stops, thereby permitting an operator to examine said flagged bill;

denomination selection elements corresponding to one or more denominations whereby selection of one of said

denomination selection elements increases either (i) a denomination counter corresponding to the denomination of said flagged bill, (ii) said total value counter by the value of said flagged bill, or (iii) both and whereby said currency discrimination device resumes operation; said denomination selection elements enabling said operator to increment a respective denomination counter and/or total value counter and to restart the operation of the currency discriminator when said operator determines said flagged bill is acceptable; and

a continuation element the selection of which resumes operation of said currency discriminator without increasing one of said denomination counters or said total value counter.

44. The discrimination device of claim 43 having a single output receptacle.

45. The discrimination device of claim 43 having exactly two output receptacles.

46. The discrimination device of claim 43 wherein said predetermined criteria is denomination and wherein the operation of said counting and discrimination device being suspended when said discriminating unit is unable to identify the denomination of a bill, a bill whose denomination is not determined by said discriminating unit being a no call bill.

47. The discrimination device of claim 46 having a single output receptacle.

48. The discrimination device of claim 46 having exactly two output receptacles.

49. The currency discrimination device of claim 43 wherein said continuation element permits an operator to remove said flagged bill from said predetermined position before said discriminator resumes operation when said operator determines said flagged bill is not acceptable.

50. The discrimination device of claim 43 wherein said predetermined position within said discrimination device when said transport mechanism stops is the position within one of said one or more output receptacles associated with the last received bill in said one or said one or more output receptacles.

51. The discrimination device of claim 43 further comprising an inspection station and wherein said predetermined position within said discrimination device when said transport mechanism stops is an inspection station.

52. The discrimination device of claim 43 wherein said denomination selection elements enable said operator to re-orient the failing bill within said predetermined position before the operation of the discrimination device is resumed if desired.

53. The discrimination device of claim 52 wherein said predetermined criteria is a bill having a predetermined forward/reverse orientation.

54. The discrimination device of claim 52 wherein said predetermined criteria is a bill having a predetermined face orientation.

55. A currency counting and discrimination device for receiving a stack of currency bills, rapidly counting and discriminating the bills in the stack, and then transferring identified bills to one of a plurality of output receptacles, comprising:

an input receptacle for receiving a stack of currency bills to be discriminated;

a discriminating unit for discriminating said currency bills based on a predetermined criteria, said discriminating unit determining the denominations of said currency bills;

one or more output receptacle for receiving said currency bills after being discriminated by said discriminating unit;

a transport mechanism for transporting said currency bills, one at a time, from said input receptacle passed said discriminating unit to either

(a) an appropriate one of said one or more output receptacles when said discriminating unit is able to discriminate a bill based on said predetermined criteria or

(b) an inspection station when said discriminating unit is unable to discriminate a bill based on said criteria; wherein the operation of said counting and discrimination device is thereafter suspended in the event of an undiscriminated bill, thereby permitting an operator to conveniently examine said undiscriminated bill;

either (a) one or more denomination counters associated with one or more denominations; each counter keeping track of the number of discriminated bills belonging to the associated denomination as determined by said discrimination unit; or

(b) a total value counter maintaining the total value of said bills as they are discriminated by said discrimination unit; or

(c) both one or more denomination counters and a total value counter;

denomination selection elements corresponding to one or more denominations whereby selection of one of said denomination selection elements (a) increases either (i) a denomination counter corresponding to the denomination of said selected denomination selection element, (ii) said total value counter by the value associated with said selected denomination selection element, or (iii) both and (b) restarts the operation of said currency counting and discrimination device; said transport mechanism hereafter transporting said undiscriminated bill to an appropriate one of said output receptacles; said denomination selection elements enabling said operator to thereby conveniently increment a respective denomination counter and/or total value counter and to restart the operation of the currency counting and discrimination device when said operator determines said undiscriminated bill is acceptable; and

a continuation element the selection of which resumes operation of said currency counting and discrimination device without increasing one of said denomination counters or said total value counter; said undiscriminated bill either being removed without replacement from said inspection station or said transport mechanism hereafter transporting said undiscriminated bill to a reject receptacle; said continuation element permitting said operator to remove said undiscriminated bill from said inspection station before said device resumes operation or have said undiscriminated bill transported to said reject receptacle after said device resumes operation when said operator determines said undiscriminated bill is not acceptable.

56. The discrimination device of claim 55 having a single output receptacle.

57. The discrimination device of claim 55 having exactly two output receptacles.

58. The discrimination device of claim 55 wherein said predetermined criteria is denomination and wherein a bill whose denomination is not determined by said discriminating unit is transported to said inspection station and wherein the operation of said counting and discrimination device is suspended.

59. The discrimination device of claim 58 having a single output receptacle.

60. The discrimination device of claim 58 having exactly two output receptacles.

61. A method of discriminating and counting documents comprising the steps of:

receiving a stack of documents in an input receptacle of a document evaluation device;

feeding said documents, under the control of said evaluation device, in said input receptacle one at a time to a discriminating unit; and

transferring said documents, under the control of said evaluation device, from said discriminating unit to an output receptacle;

incrementing, under the control of said evaluation device, a count corresponding to a plurality of different types of documents the system is capable of discriminating when said discriminating unit identifies a document;

stopping, under the control of said evaluation device, said transferring step when said discriminating unit is unable to identify a document so that said unidentified document is located at a predetermined position within said output receptacle;

an operator of said evaluation device examining said unidentified document; and said operator either

(a) depressing a key corresponding to the identity of said unidentified document when said examining step results in a determination that said document is acceptable, whereby, under the control of said discrimination device, said corresponding count associated with the identity of said unidentified document is incremented and said transferring step is continued; or

(b) removing said unidentified document without replacement when said examining step does not result in a determination that said unidentified document is acceptable and depressing a continuation key whereby, under the control of said document evaluation device, said transferring step is continued.

62. A method of discriminating and counting documents comprising the steps of:

receiving a stack of documents in an input receptacle of a document discrimination device, said documents being of one or more document types;

feeding said documents in said input receptacle, under the control of said discrimination device, one at a time to a discriminating unit; and

discriminating, under the control of said discrimination device, said documents based on a predetermined criteria, said step of discriminating including determining the document type of each of said documents;

transferring, under the control of said discrimination device, said documents from said discriminating unit to an output receptacle;

incrementing, under the control of said discrimination device, a count corresponding to one of a plurality of different types of documents the system is capable of discriminating when said discriminating unit identifies a document as satisfying said predetermined criteria;

stopping, under the control of said discrimination device, said transferring step when a document fails to satisfy said predetermined criteria or when said discriminating unit is unable to determine whether a document satisfies said predetermined criteria, said transferring step stopping so that the document that triggered said stopping step is located at a predetermined position within said output receptacle;

an operator of said discrimination device examining said triggering document; and said operator either

(a) depressing a key corresponding to the identity of said triggering document when said examining step results in a determination that said document is acceptable, whereby, under the control of said discrimination device, said corresponding count associated with the identity of said triggering document is incremented and said transferring step is continued; or

(b) removing said triggering document without replacement when said examining step does not result in a determination that said triggering document is acceptable and depressing a continuation key whereby, under the control of said discrimination device, said transferring step is continued.

63. A document counting and discrimination device for receiving a stack of documents, rapidly counting and discriminating the documents in the stack, and then re-stacking the documents comprising:

an input receptacle for receiving a stack of documents to be discriminated;

a discriminating unit for discriminating said documents as belonging to one or more document-types;

an output receptacle for receiving said documents after being discriminated by said discriminating unit;

a transport mechanism for transporting said documents, one at a time, from said input receptacle passed said discriminating unit to said output receptacle;

either (a) one or more document-type counters associated with one or more document-types; each counter keeping track of the number of discriminated documents belonging to the associated document-type as determined by said discrimination unit; or

(b) a total value counter maintaining the total value of said discriminated documents as they are discriminated by said discrimination unit where said documents have associated values or denominations; or

(c) both one or more document-type counters and a total value counter;

wherein the operation of the discrimination device is suspended when said discriminating unit is unable to identify a document; the operation of the device being stopped so that said unidentified document is the last document transported to said output receptacle before the operation of the device is suspended, thereby permitting an operator to conveniently examine said unidentified document;

document-type selection elements corresponding to one or more document-types whereby selection of one of said document-type selection elements increases either (i) a document-type counter corresponding to said unidentified document, (ii) said total value counter by the value of said unidentified document, or (iii) both and whereby the document discrimination device resumes operation; said document-type selection elements enabling said operator to thereby conveniently increment a respective denomination counter and/or total value counter and to restart the operation of the document discriminator when said operator determines said unidentified document is acceptable; and

a continuation element the selection of which resumes operation of the document discrimination device without increasing one of said denomination counters or said total value counter, thereby permitting said operator to remove said unidentified document from said output receptacle before said discriminator resumes operation when said operator determines said unidentified document is not acceptable.

64. A method of discriminating and counting currency bills using a currency discriminating device having value indicating means and a plurality of denomination counters associated with a plurality of denominations of bills that the device is capable of discriminating and/or a value counter comprising the steps of:

receiving a stack of currency bills in an input receptacle of the document discriminating device;

the discriminating device feeding said bills in said input receptacle one at a time past a discriminating unit to one or more output receptacles, said discriminating unit determining the denomination of each bill;

the discriminating device incrementing an appropriate one of the plurality of denomination counters corresponding to denomination of a bill when said discriminating unit determines the denomination of said bill and/or incrementing a value counter by the value of said bill, the value of said bill being determined by the denomination of said bill; and

an operator of the device manually entering the denomination of a bill whose denomination is not determined by said discriminating unit, said step of manually entering the denomination of a bill comprising the operator manually selecting the denomination of said bill whose denomination is not determined by said discriminating unit by using the value indicating means of the device, said step of selecting causing the discriminating device to increment by one the denomination counter associated with said selected denomination and/or causing the discriminating device to increment the value counter by the value of said selected denomination.

65. A currency counting and discrimination device for receiving a stack of currency bills, rapidly counting and discriminating the bills in the stack, and then re-stacking the bills comprising:

an input receptacle for receiving a stack of currency bills to be discriminated;

a discriminating unit for discriminating the denomination of said currency bills;

one or more output receptacles for receiving said currency bills after being discriminated by said discriminating unit;

a transport mechanism for transporting said currency bills, one at a time, from said input receptacle past a sensor of said discriminating unit and to said one or more output receptacles; and

one or more counters keeping track of the value of bills discriminated; and

a plurality of denomination keys, each key being associated with a given denomination;

wherein the operation of said device is suspended when said discriminating unit is unable to identify the denomination of a bill and wherein the selection of one of said plurality of denomination keys appropriately increments said one or more counters based on the denomination associated with said one key that is selected.

66. The discrimination device of claim 65 wherein the selection of one of said plurality of denomination keys causes the operation of the device to be resumed.

67. The discrimination device of claim 66 having a single output receptacle.

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(54) **METHOD AND APPARATUS FOR DISCRIMINATING AND COUNTING DOCUMENT**

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(63) Continuation of application No. 08/573,392, filed on Dec. 15, 1995, now Pat. No. 5,790,697, which is a continuation-in-part of application No. 08/399,854, filed on Mar. 7, 1995, now Pat. No. 5,875,259, and a continuation-in-part of application No. 08/394,752, filed on Feb. 27, 1995, now Pat. No. 5,724,438, and a continuation-in-part of application No. 08/362,848, filed on Dec. 22, 1994, now Pat. No. 5,870,487, and a continuation-in-part of application No. 08/340,031, filed on Nov. 14, 1994, now Pat. No. 5,815,592, and a continuation-in-part of application No. 08/317,349, filed on Oct. 4, 1994, now Pat. No. 5,640,463, and a continuation-in-part of application No. 08/287,882, filed on Aug. 9, 1994, now Pat. No. 5,652,802, and a continuation-in-part of application No. 08/243,807, filed on May 16, 1994, now Pat. No. 5,633,949, and a continuation-in-part of application No. 08/226,660, filed on Apr. 12, 1994, said application No. 08/399,854, is a continuation-in-part of application No.08/394,752, and a continuation-in-part of application No. 08/340,031, said application No. 08/394,752, is a continuation-in-part of application No.08/340,031, and a continuation-in-part of application No. 08/127,334, filed on Sep. 27, 1993, now Pat. No. 5,467,405, said application No. 08/362, 848, filed on Dec. 22, 1994, now Pat. No. 5,870,487, is a continuation-in-part of application No.08/340,031, which is

a continuation-in-part of application No. 08/243,807, and a continuation-in-part of application No. 08/207,592, filed on Mar. 8, 1994, now Pat. No. 5,467,406, said application No. 08/287,882, is a continuation-in-part of application No.08/ 207,592, and a continuation-in-part of application No. 08/219,093, filed on Mar. 29, 1994, now abandoned, and a continuation-in-part of application No. 08/127,334, said application No. 08/243,807, is a continuation-in-part of application No.08/219,093, and a continuation-in-part of application No. 08/127,334, said application No. 08/226, 660, is a continuation-in-part of application No.08/127,334, filed on Sep. 27, 1993, now Pat. No. 5,467,405, said application No. 08/219,093, is a continuation-in-part of application No.08/127,334, said application No. 08/207,592, is a continuation-in-part of application No.08/127,334, which is a continuation of application No. 07/885,648, filed on May 19, 1992, now Pat. No. 5,295,196, which is a continuation-in-part of application No. 07/475,111, filed on Feb. 5, 1990, now abandoned.

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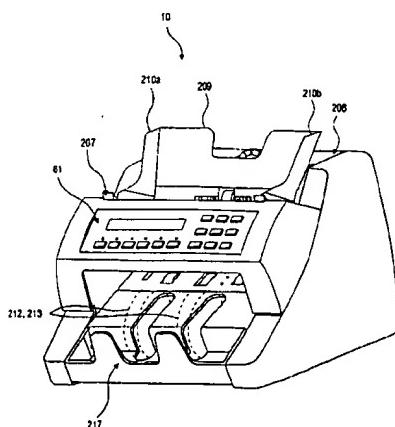
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(57) **ABSTRACT**

A currency counting and discrimination device for receiving a stack of currency bills, rapidly counting and discriminating the bills in the stack, and then re-stacking the bills. The device comprises an input receptacle for receiving a stack of currency bills to be discriminated, a discriminating unit for discriminating the denomination of the currency bills, and one or more output receptacles for receiving the currency bills after being discriminated by the discriminating unit. The device further comprises a transport mechanism for transporting the currency bills, one at a time, from the input receptacle past a sensor of the discriminating unit and to the receptacle past a sensor of the discriminating unit and to the

one or more output receptacles. One or more counters keep track of the value of bills that are discriminated. Furthermore, means are provided for an operator of the device to indicate the value of any bills whose denomination are not determined by the discriminating unit; the bills whose denomination are not determined by the discriminating unit being termed no call bills. The value indicating means appropriately effects the one or more counters.

58 Claims, 81 Drawing Sheets

having six columns and sixteen rows. The controller is programmed to divide the switch elements in each column into groups of three to form five switches in each column. Actuation of any one of the three switch elements forming a switch actuates the switch. The uppermost switch element in each column remains on its own and is unused.

Although the touch screen **2960** uses an X-Y matrix of optically transparent switches to detect the location of a touch, alternative types of touch screens may be substituted for the touch screen **2960**. These alternative touch screens use such well-known techniques as crossed beams of infrared light, acoustic surface waves, capacitance sensing, and resistive membranes to detect the location of a touch. The structure and operation of the alternative touch screens are described and illustrated, for example, in U.S. Pat. Nos. 5,317,140, 5,297,030, 5,231,381, 5,198,976, 5,184,115, 5,105,186, 4,931,782, 4,928,094, 4,851,616, 4,811,004, 4,806,709, and 4,782,328, which are incorporated herein by reference.

We claim:

1. A currency denominating device adapted to receive a stack of currency bills, rapidly denominate and count the bills in the stack, and re-stack the bills comprising:

    a bill input receptacle adapted to receive a stack of currency bills;

    at least one output receptacle;

    a bill transport defining a transport path and adapted to transport the bills, one at a time, from the input receptacle to the output receptacle along the transport path;

    a sensor positioned adjacent to the transport path;

    a control panel having an input device adapted to receive input from an operator of the device; and

    a processor electrically coupled to the sensor and the control panel and programmed to:

        (a) denominate bills;

        (b) keep track of the value of bills processed;

        (c) suspend the operation of the device when the denominating processor is unable to identify the denomination of a bill;

        (d) enable the operator, upon suspension of the operation of the device, to designate via the control panel the denomination of a bill whose denomination is not determined by the processor; and

        (e) enable the operator, upon suspension of the operation of the device, to restart the operation of the device without designating the denomination of a bill whose denomination is not determined by the processor.

2. The device of claim 1 wherein the processor is programmed to restart the operation of the device after the operator designates the denomination of a bill whose denomination is not determined by the processor.

3. The device of claim 1 wherein the processor is programmed to suspend the operation of the device with the bill whose denomination the processor is unable to identify being located in the output receptacle.

4. A currency denominating device comprising:

    a bill input receptacle;

    at least one output receptacle;

    a bill transport defining a transport path between the input receptacle and the output receptacle;

    a sensor positioned adjacent to the transport path;

    a control panel having an input device adapted to receive input from an operator of the device; and

    a processor electrically coupled to the sensor and the control panel and programmed to:

        (a) denominate bills;

        (b) keep track of the value of bills processed;

        (c) set a flag when the denominating processor is unable to identify the denomination of a bill;

        (d) suspend the operation of the device when the flag is set;

        (e) enable the operator, upon suspension of the operation of the device, to designate via the control panel the denomination of a bill whose denomination is not determined by the processor; and

        (f) enable the operator, upon suspension of the operation of the device, to restart the operation of the device without designating the denomination of a bill whose denomination is not determined by the processor.

5. The device of claim 4 wherein the processor is programmed to suspend the operation of the device with the bill whose denomination the processor is unable to identify being located in the output receptacle.

6. Currency denominating apparatus comprising:

    a bill input receptacle;

    at least one output receptacle;

    a bill transport adapted to transfer bills between the input receptacle and the output receptacle;

    one or more sensors positioned proximate the bill transport and operable to generate signals indicative of denominational characteristics of bills transported by the transport;

    a plurality of denomination keys corresponding to a plurality of denominations;

    a continuation key; and

    a processor programmed to:

        (a) denominate bills transported by the bill transport in response to the signals generated by the one or more sensors,

        (b) keep track of the denominations of the bills in one or more counters;

        (c) suspend operation of the transport when the processor is unable to denominate a bill based on the signals;

        (d) reflect, upon selection of one of the denomination keys after the operation of the transport has been suspended, the denomination corresponding to the selected denomination key in the one or more counters; and

        (e) restart the operation of the transport without adversely affecting the one or more counters upon selection of the continuation key after the operation of the transport has been suspended.

7. The device of claim 6 wherein the processor is programmed to restart the operation of the device upon selection of one of the denomination keys after the operation of the transport has been suspended.

8. Currency denominating apparatus comprising:

    a bill input receptacle adapted to receive a stack of currency bills;

    at least one output receptacle;

    a bill transport adapted to transfer bills, one at a time, from the input receptacle to the output receptacle;

    one or more sensors positioned proximate the bill transport and operable to generate signals indicative of denominational characteristics of bills transported by the transport;

    a plurality of denomination keys corresponding to a plurality of denominations;

a continuation key;

a denomination counter corresponding to each of the plurality of denominations; and

a processor programmed to:

(a) denominate bills transported by the bill transport in response to the signals generated by the one or more sensors,

(b) keep track of the number of bills of each of the plurality of denominations by incrementing the corresponding denomination counter each time the processor denominates a bill;

(c) suspend operation of the transport when the processor is unable to denominate a bill based on the signals with the bill which the processor was unable to denominate being located at a position where it can be conveniently examined and if desired removed from the device;

(d) upon a single depression of one of the denomination keys after the operation of the transport has been suspended, increment the denomination counter corresponding to the denomination of the depressed denomination key and restart the operation of the transport; and

(e) restart the operation of the transport without adversely affecting the denomination counters upon depression of the continuation key after the operation of the transport has been suspended.

9. Currency denominating apparatus comprising:

a bill input receptacle adapted to receive a stack of currency bills;

at least one output receptacle;

a bill transport adapted to transfer bills, one at a time, from the input receptacle to the output receptacle;

one or more sensors positioned proximate the bill transport and operable to generate signals indicative of denominational characteristics of bills transported by the transport;

a plurality of denomination keys corresponding to a plurality of denominations;

a continuation key;

a denomination counter corresponding to each of the plurality of denominations; and

a processor programmed to:

(a) denominate bills transported by the bill transport in response to the signals generated by the one or more sensors,

(b) keep track of the number of bills of each of the plurality of denominations by incrementing the corresponding denomination counter each time the processor denominates a bill;

(c) suspend operation of the transport when the processor is unable to denominate a bill based on the signals with the bill which the processor was unable to denominate being located in the output receptacle where it can be conveniently examined and if desired removed from the device;

(d) upon a single depression of one of the denomination keys after the operation of the transport has been suspended, increment the denomination counter corresponding to the denomination of the depressed denomination key and restart the operation of the transport; and

(e) restart the operation of the transport without adversely affecting the denomination counters upon depression of the continuation key after the operation of the transport has been suspended.

10. Currency denominating apparatus comprising:

a bill input receptacle adapted to receive a stack of currency bills;

at least one output receptacle;

a bill transport adapted to transfer bills, one at a time, from the input receptacle to the output receptacle;

one or more sensors positioned proximate the bill transport and operable to generate signals indicative of denominational characteristics of bills transported by the transport;

a plurality of denomination keys corresponding to a plurality of denominations;

a continuation key;

a denomination counter corresponding to each of the plurality of denominations; and

a processor programmed to:

(a) denominate bills transported by the bill transport in response to the signals generated by the one or more sensors,

(b) keep track of the number of bills of each of the plurality of denominations by incrementing the corresponding denomination counter each time the processor denominates a bill;

(c) suspend operation of the transport when the processor is unable to denominate a bill based on the signals with the bill which the processor was unable to denominate being located as the last bill delivered to the output receptacle where it can be conveniently examined and if desired removed from the device;

(d) upon a single depression of one of the denomination keys after the operation of the transport has been suspended, increment the denomination counter corresponding to the denomination of the depressed denomination key and restart the operation of the transport; and

(e) restart the operation of the transport without adversely affecting the denomination counters upon depression of the continuation key after the operation of the transport has been suspended.

11. A compact, high-speed currency denominating apparatus comprising:

a bill input receptacle adapted to receive a stack of currency bills;

a single one output receptacle;

a bill transport adapted to transfer bills, one at a time, from the input receptacle to the output receptacle at rate of at least 1000 bills per minute;

one or more sensors positioned proximate the bill transport and operable to generate signals indicative of denominational characteristics of bills transported by the transport;

a plurality of denomination keys corresponding to a plurality of denominations;

a continuation key;

a denomination counter corresponding to each of the plurality of denominations; and

a processor programmed to:

(a) denominate bills transported by the bill transport in response to the signals generated by the one or more sensors,

(b) keep track of the number of bills of each of the plurality of denominations by incrementing the corresponding denomination counter each time the processor denominates a bill;

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(c) suspend operation of the transport when the processor is unable to denominate a bill based on the signals with the bill which the processor was unable to denominate being located as the last bill delivered to the output receptacle where it can be conveniently examined and if desired removed from the device;

(d) upon a single depression of one of the denomination keys after the operation of the transport has been suspended, increment the denomination counter corresponding to the denomination of the depressed denomination key and restart the operation of the transport; and

(e) restart the operation of the transport without adversely affecting the denomination counters upon depression of the continuation key after the operation of the transport has been suspended.

12. A high-speed currency denominating apparatus comprising:

a bill input receptacle adapted to receive a stack of currency bills;

exactly two output receptacles;

a bill transport adapted to transfer bills, one at a time, from the input receptacle to one of the output receptacles at rate of at least 1000 bills per minute;

one or more sensors positioned proximate the bill transport and operable to generate signals indicative of denominational characteristics of bills transported by the transport;

a plurality of denomination keys corresponding to a plurality of denominations;

a continuation key;

a denomination counter corresponding to each of the plurality of denominations; and

a processor programmed to:

(a) denominate bills transported by the bill transport in response to the signals generated by the one or more sensors,

(b) keep track of the number of bills of each of the plurality of denominations by incrementing the corresponding denomination counter each time the processor denominates a bill;

(c) suspend operation of the transport when the processor is unable to denominate a bill based on the signals with the bill which the processor was unable to denominate being located as the last bill delivered to one of the output receptacles where it can be conveniently examined and if desired removed from the device;

(d) upon a single depression of one of the denomination keys after the operation of the transport has been suspended, increment the denomination counter corresponding to the denomination of the depressed denomination key and restart the operation of the transport; and

(e) restart the operation of the transport without adversely affecting the denomination counters upon depression of the continuation key after the operation of the transport has been suspended.

13. A currency denominating device comprising:

a bill input receptacle;

at least one output receptacle;

a bill transport defining a transport path between the input receptacle and the output receptacle;

at least one sensor positioned adjacent to the transport path;

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a bill denominating processor electrically coupled to the sensor;

one or more counters keeping track of the value of bills processed;

a controller programmed to suspend the operation of the device when the denominating processor is unable to identify the denomination of a bill;

a plurality of denomination keys associated with different bill denominations, the denomination keys enabling the operator to designate the value of a bill whose denomination is not determined by the processor upon suspension of the operation of the device; and

a continuation key enabling the operator, upon suspension of the operation of the device, to restart the operation of the device without designating the value of a bill whose denomination is not determined by the processor.

14. The device of claim 13 wherein the denomination keys enable the operator to both designate the value of a bill whose denomination is not determined by the processor upon suspension of the operation of the device and restart the operation of the device with the touch of a single denomination key.

15. A currency counting and discrimination device for receiving a stack of currency bills, rapidly counting and discriminating the bills in the stack, and then re-stacking the bills comprising:

an input receptacle adapted to receive a stack of currency bills to be discriminated;

a discriminating unit adapted to discriminate the denomination of the currency bills;

one or more output receptacles adapted to receive the currency bills after being discriminated by the discriminating unit;

a transport mechanism adapted to transport the currency bills, one at a time, from the input receptacle past a sensor of the discriminating unit and to the one or more output receptacles;

one or more counters adapted to keep track of the value of bills discriminated;

a controller programmed to suspend the operation of the transport mechanism when the discriminating unit is unable to identify the denomination of a bill; and

an operator interface capable of receiving input from an operator of the device, the interface enabling, upon suspension of the operation of the device, the operator to either (a) indicate the value of a bill whose denomination is not determined by the discriminating unit and restart the operation of the device or (b) restart the operation of the device without indicating the value of a bill whose denomination is not determined by the discriminating unit.

16. The device of claim 15 wherein the controller is programmed to suspend the transport mechanism with the bill whose denomination the discriminating unit is unable to identify being located in the output receptacle.

17. A currency denominating device comprising:

an input receptacle;

one or more output receptacles;

a bill transport defining a transport path between the input receptacle and the one or more output receptacles;

a sensor positioned adjacent to the transport path;

a bill denominating processor electrically coupled to the sensor;

one or more counters keeping track of the value of bills processed;

the processor being programmed to denominate bills and flag bills meeting or failing to meet predetermined criteria;

value indicating means for an operator of said device to designate the value of any flagged bills, the means appropriately affecting the one or more counters;

wherein the predetermined criteria is the denominating processor identifying the denomination of a bill and wherein the processor flags a bill failing to be identified by the processor by suspending the operation of the device, the device being halted so that the flagged bill is located at an identifiable location within the output receptacle when the bill transport stops.

18. An apparatus for processing paper currency having selected denominations which comprises:

a bill input receptacle;

a bill discrimination unit capable of denominating bills including bills of a plurality of denominations;

counters operable to count bills of each denomination denominated by the bill discrimination unit or by the visual discrimination;

one or more bill output receptacles;

a bill transport operable to transport bills from the input receptacle past the bill discrimination unit to the bill output receptacles;

a plurality of denomination keys corresponding to the plurality of denominations;

a continuation key; and

a programmable controller operable to actuate and coordinate operation of the bill transport and the bill discrimination unit, and to suspend operation of the transport in a manner that a bill that the discrimination unit can not denominate is positioned so as to enable visual discrimination of the bill, and to increment an appropriate counter upon selection of one of the denomination keys following suspension of the operation of the transport, and to restart the operation of the transport without incrementing one of the counters upon selection of the continuation key following suspension of the operation of the transport.

19. The apparatus of claim 18 wherein the controller is programmed to suspend the transport with the bill whose denomination the discrimination unit can not denominate being located in the output receptacle so as to enable its removal prior to selection of the continuation key.

20. A currency denominating device comprising:

a bill input receptacle;

at least one output receptacle;

a bill transport defining a transport path between the input receptacle and the output receptacle;

a sensor positioned adjacent to the transport path;

a bill denominating processor electrically coupled to the sensor;

one or more counters electrically coupled to the processor keeping track of the value of bills processed;

the processor being programmed to suspend the operation of the device when the processor is unable to identify the denomination of a bill; and

a control panel enabling the operator to designate the value of a bill whose denomination is not determined by the processor, the bill whose denomination is not determined by the processor being a no call bill, the

control panel alternatively enabling the operator to restart the operation of the device without designating the value of a bill whose denomination is not determined by the processor.

21. The device of claim 20 wherein the processor is programmed to suspend the operation of the device with the bill whose denomination the processor is unable to identify being located in the output receptacle so as to enable its removal.

22. The denominating device of claim 20 wherein the input and output receptacles and the bill transport are contained within a housing and wherein the control panel is affixed to the housing between the input and output receptacles.

23. A currency denominating device comprising:

a bill input receptacle;

at least one output receptacle;

a bill transport defining a transport path between the input receptacle and the output receptacle;

a sensor positioned adjacent to the transport path;

a bill denominating processor electrically coupled to the sensor;

one or more counters keeping track of the value of bills processed;

a flag associated with the processor that is set when the denominating processor is unable to identify the denomination of a bill, wherein the operation of the device is suspended when the flag is set; and

a control panel having an input device to receive input from an operator of the device, the control panel enabling the operator to designate the denomination of a bill whose denomination is not determined by the processor, the bill whose denomination is not determined by the processor being a no call bill, the control panel additionally enabling the operator to restart the operation of the device without designating the denomination of a no call bill.

24. The device of claim 23 wherein the operation of the device is suspended when the flag is set with the no call bill being located in the output receptacle thereby enabling the operator to remove the no call bill when the operation of the device is to be restarted without designating the denomination of the no call bill.

25. A currency counting and discrimination device for receiving a stack of currency bills, rapidly counting and discriminating the bills in the stack comprising:

an input receptacle adapted to receive a stack of currency bills to be discriminated;

a denomination discriminating unit adapted to discriminate the denomination of the currency bills;

one or more output receptacles adapted to receive the currency bills after being discriminated by the discriminating unit;

a transport mechanism adapted to transport the currency bills, one at a time, from the input receptacle past a sensor of the discriminating unit and to the one or more output receptacles; and

one or more counters adapted to keep track of the value of bills discriminated; and

a plurality of denomination keys, each key being associated with a given denomination; and

a continuation key;

wherein the operation of the device is suspended when the discriminating unit is unable to identify the denomina-

tion of a bill and wherein the selection of one of the plurality of denomination keys appropriately increments the one or more counters based on the denomination associated with the denomination key that is selected and wherein the selection of the continuation key restarts the operation of the device without adding the value of the unidentified bill to the one or more counters.

26. The discrimination device of claim 25 wherein the selection of one of the plurality of denomination keys causes the operation of the device to be resumed.

27. The discrimination device of claim 26 having a single output receptacle.

28. The device of claim 25 wherein the operation of the device is suspended with the unidentified bill being located in the output receptacle thereby enabling its removal prior to selection of the continuation key.

29. A bill counting and discrimination device for receiving a stack of bills, rapidly counting and discriminating the bills in the stack, and then re-stacking the bills comprising:

an input receptacle adapted to receive a stack of bills to be discriminated;

a denomination discriminating unit adapted to denominate the bills;

an output receptacle adapted to receive the bills after being denominated by the discriminating unit;

a transport mechanism adapted to transport the bills, one at a time, from the input receptacle past a sensor of the discriminating unit to the output receptacle;

either

(a) one or more denomination counters; each counter keeping track of the number of denominated bills having to the associated denomination as determined by the discrimination unit; or

(b) a total value counter maintaining the total value of the denominated bills as they are denominated by the discrimination unit; or

(c) both one or more denomination counters and a total value counter;

wherein the operation of the discrimination device is suspended when the discriminating unit is unable to identify the denomination of a bill; the operation of the device being stopped so that the unidentified bill is the last bill transported to the output receptacle before the operation of the device is suspended, thereby permitting an operator to conveniently examine the unidentified bill;

denomination selection elements corresponding to one or more denominations whereby selection of one of the denomination selection elements increases either (i) a denomination counter corresponding to the unidentified bill, (ii) the total value counter by the value of the unidentified bill, or (iii) both and whereby the discrimination device resumes operation; the denomination selection elements enabling the operator to thereby conveniently increment a respective denomination counter and/or total value counter and to restart the operation of the device when the operator determines the unidentified bill is acceptable; and

a continuation element the selection of which resumes operation of the discrimination device without increasing one of the denomination counters or the total value counter, thereby permitting the operator to remove the unidentified bill from the output receptacle before the discriminator resumes operation when the operator determines the unidentified bill is not acceptable.

30. A currency counting and denominating device for receiving a stack of currency bills, rapidly counting and denominating the bills in the stack, and then re-stacking the bills comprising:

an input receptacle adapted to receive a stack of currency bills to be discriminated;

a discriminating unit adapted to discriminate the denomination of the currency bills;

one or more output receptacles adapted to receive the currency bills after being denominated by the discriminating unit;

a transport mechanism adapted to transport the currency bills, one at a time, from the input receptacle past a sensor of the discriminating unit and to the one or more output receptacles;

one or more counters adapted to keep track of the bills discriminated; and

wherein the operation of the device is suspended when the discriminating unit is unable to identify the denomination of a bill;

denomination keys enabling an operator of the device to designate the denomination of a bill whose denomination is not determined by the discriminating unit; and

a continuation key enabling an operator of the device to restart the device after the operation of the device has been suspended without adversely affecting the counters.

31. A currency counting and discrimination device for receiving a stack of currency bills, rapidly counting and discriminating the bills in the stack, and then re-stacking the bills comprising:

an input receptacle adapted to receive a stack of currency bills to be discriminated;

a discriminating unit adapted to discriminate the denomination of the currency bills;

one or more output receptacles adapted to receive the currency bills after being discriminated by the discriminating unit;

a transport mechanism adapted to transport the currency bills, one at a time, from the input receptacle past a sensor of the discriminating unit and to the one or more output receptacles; and

one or more counters keeping track of the bills discriminated; and

a plurality of denomination keys, each key being associated with a given denomination; and

a continuation key;

wherein the operation of the device is suspended when the discriminating unit is unable to identify the denomination of a bill and wherein the depression of one of the plurality of denomination keys causes the corresponding denomination to be selected and wherein the depression of the continuation key causes the operation of the device to be resumed.

32. The device of claim 31 wherein the depression of one of the plurality of denomination keys further causes one or more counters to be appropriately incremented based on the denomination associated with the denomination key that is selected.

33. The device of claim 32 wherein the depression of one of the plurality of denomination keys further causes the operation of the device to be resumed.

34. The device of claim 32 wherein the operation of the device is suspended with the bill whose denomination the

discriminating unit is unable to identify being located in the output receptacle thereby enabling its removal prior to depression of the continuation key.

35. The device of claim 31 wherein depression of a key after the depression of one of the denomination keys causes the denomination associated with the depressed denomination key to be indicated to the device.

36. A currency counting and discrimination device for receiving a stack of currency bills, rapidly counting and discriminating the bills in the stack, and then re-stacking the bills comprising:

an input receptacle adapted to receive a stack of currency bills to be discriminated;

a discriminating unit adapted to discriminate the denomination of the currency bills;

one or more output receptacles adapted to receive the currency bills after being discriminated by the discriminating unit;

a transport mechanism adapted to transport the currency bills, one at a time, from the input receptacle past a sensor of the discriminating unit and to the one or more output receptacles; and

one or more counters keeping track of the bills discriminated; and

a plurality of denomination keys, each key being associated with a given denomination; and

one or more additional keys;

wherein the operation of the device is suspended when the discriminating unit is unable to identify the denomination of a bill and wherein the depression of one of the plurality of denomination keys causes the corresponding denomination to be selected and wherein the depression of one of the additional keys causes the operation of the device to be resumed without adversely affecting the one or more counters.

37. The device of claim 36 wherein depression of one of the additional keys after the depression of one of the denomination keys causes the denomination associated with the depressed denomination key to be indicated to the device.

38. The device of claim 36 wherein depression of one of the additional keys after the depression of one of the denomination keys causes the one or more counters to be appropriately incremented based on the denomination associated with the depressed denomination key.

39. A currency denominating device comprising:

first means for receiving bills to be denominated;

second means for receiving bills after they have been processed;

means for transporting bills from the first means to the second means;

means for denominating bills;

means for keeping track of the value of bills processed;

means for suspending the operation of the device when the means for denominating bills fails to identify the denomination of a bill;

means for the operator to input the denomination of a bill whose denomination is not determined by the means for denominating, the bill whose denomination is not determined by the means for denominating being a no call bill; and

means for the operator to cause the operation of the device to be resumed without adversely affecting the means for keeping track of the value of the bills.

40. The device of claim 39 further comprising means for appropriately affecting the means for keeping track of the value of bills in response to the operator inputting the denomination of a no call bill.

41. The device of claim 40 further comprising means for resuming the operation of the device after the operator has input the denomination of a no call bill.

42. A method of discriminating and counting currency bills comprising:

receiving a stack of currency bills in an input receptacle of a currency evaluation device;

transferring the bills, under the control of the evaluation device, one at a time from the input receptacle, past a sensor of a discriminating unit, to an output receptacle;

determining, under control of the evaluation device, the denomination of each passing bill;

incrementing, under the control of the evaluation device, a count corresponding to one of a plurality of denominations based on the determined denomination of each passing bill when the device determines the denomination of a bill;

stopping, under the control of the evaluation device, the transferring when the device is unable to determine the denomination of a bill so that the bill whose denomination is not determined is located at a predetermined position within the output receptacle, the bill whose denomination is not determined being termed a no call bill;

an operator of the evaluation device examining the no call bill; and the operator either

(a) depressing a key corresponding to the denomination of the no call bill when examining results in a determination that the bill is acceptable, whereby, under the control of the discrimination device, the corresponding count associated with the denomination of the no call bill is incremented and the transferring is continued; or

(b) removing the no call bill without replacement when the examining does not result in a determination that the no call bill is acceptable and depressing a continuation key whereby, under the control of the bill evaluation device, the transferring is continued.

43. A method of discriminating and counting currency bills comprising:

receiving a stack of currency bills in an input receptacle of a currency denominating device;

transferring, under the control of the device, the bills in the input receptacle one at a time past a denominating sensor to an output receptacle;

denominating, under the control of the device, the bills based on a predetermined criterion;

incrementing, under the control of the device, a count corresponding to one of a plurality of denominations of bills the device is capable of denominating when the device identifies a bill as satisfying the predetermined criterion;

stopping, under the control of the device, the transferring when a bill fails to satisfy the predetermined criterion or when the device is unable to determine whether a bill satisfies the predetermined criterion, the transferring stopping so that the bill that triggered the stopping is located at a predetermined (an identifiable) position within the output receptacle;

an operator of the device examining the triggering bill; and the operator either

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(a) depressing a key corresponding to the denomination of the triggering bill when the examining results in a determination that the bill is acceptable, whereby, under the control of the device, the corresponding count associated with the denomination of the triggering bill is incremented and the transferring is continued; or

(b) removing the triggering bill without replacement when the examining does not result in a determination that the triggering bill is acceptable and depressing a continuation key whereby, under the control of the device, the transferring is continued.

44. A method of discriminating and counting currency bills using a currency discriminating device having denomination keys and a continuation key and one or more counters keeping track of bills processed by the device comprising:

receiving a stack of currency bills in an input receptacle of the currency discriminating device;

feeding the bills in the input receptacle one at a time past a sensor to one or more output receptacles,

generating a signal from the sensor;

determining automatically the denomination of bills fed past the sensor using the signal from the sensor;

incrementing an appropriate counter when the denomination of a bill is determined automatically;

suspending the feeding when the denomination of a bill is not automatically determined; and either

manually designating the denomination of a bill whose denomination is not automatically determined by depressing an appropriate denomination key or

manually depressing the continuation key on the device to cause the feeding to be resumed without designating the denomination of a bill whose denomination is not automatically determined.

45. The method of claim 44 further comprising the discriminating device incrementing an appropriate counter in response to the depression of the denomination key.

46. The method of claim 45 further comprising the discriminating device resuming operation in response to the depression of the denomination key.

47. The method of claim 44 wherein the discriminating device has an additional key in addition to the denomination keys and further comprising, after manually designating the denomination, the discriminating device incrementing an appropriate counter in response to the depression of the additional key.

48. The method of claim 47 further comprising the discriminating device resuming operation in response to the depression of the additional key.

49. A method of discriminating and counting currency bills using a currency discriminating device having keys including denomination keys and a continuation key and one or more counters keeping track of bills processed by the device comprising:

receiving a stack of currency bills in an input receptacle of the currency discriminating device;

feeding the bills in the input receptacle one at a time past a sensor of a discriminating unit to one or more output receptacles, the discriminating unit determining the denomination of bills fed past the sensor;

incrementing an appropriate counter when the discriminating unit determines the denomination of a bill;

suspending operation of the device when the discriminating unit fails to determine the denomination of a bill; and either

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(i) manually selecting the denomination of a bill whose denomination is not determined by the discriminating unit by depressing an appropriate denomination key or

(ii) manually selecting a continuation key.

50. The method of claim 49 further comprising manually depressing a key after the selecting the denomination to cause the selected denomination to be indicated to the device.

51. A method of discriminating and counting currency bills using a currency discriminating device having keys including denomination keys and one or more counters keeping track of bills processed by the device comprising:

receiving a stack of currency bills in an input receptacle of the currency discriminating device;

feeding the bills in the input receptacle one at a time past a sensor of a discriminating unit to one or more output receptacles, the discriminating unit determining the denomination of passing bills;

incrementing an appropriate counter when the discriminating unit determines the denomination of a bill;

suspending operation of the device when the discriminating unit fails to determine the denomination of a bill; and either

(i) manually selecting an appropriate denomination key corresponding to the denomination of a bill whose denomination is not determined by the discriminating unit;

(ii) manually selecting a continuation key.

52. The method of claim 51 wherein the selecting an appropriate denomination key comprising scrolling to the denomination to be selected.

53. The method of claim 52 further comprising the operator manually selecting a key after the selecting an appropriate denomination key to cause the selected denomination to be indicated to the device.

54. The method of claim 51 further comprising the operator manually selecting a key after the selecting an appropriate denomination key to cause the selected denomination to be indicated to the device.

55. A method of discriminating and counting currency bills using a currency discriminating device having a control panel and one or more counters keeping track of bills processed by the device comprising:

receiving a stack of currency bills in an input receptacle of the currency discriminating device;

the discriminating device feeding the bills in the input receptacle one at a time past a sensor of a discriminating unit to one or more output receptacles, the discriminating unit determining the denomination of passing bills;

the discriminating device incrementing an appropriate counter when the discriminating unit determines the denomination of a bill;

the discriminating device suspending operation when the discriminating unit fails to determine the denomination of a bill; and

an operator of the device either

(a) using the control panel to manually communicate the denomination of a bill whose denomination is not determined by the discriminating unit to the discriminating unit or

(b) using the control panel to manually restart the operation of the device without communicating the denomination of a bill whose denomination is not determined by the discriminating unit to the discriminating unit.

56. The method of claim **55** further comprising the discriminating device resuming operation after the operator communicates the denomination of the bill.

57. A method of discriminating and counting currency bills using a currency discriminating device having a control panel and one or more counters keeping track of bills processed by the device comprising:

receiving a stack of currency bills in an input receptacle of the currency discriminating device;

feeding the bills in the input receptacle one at a time past a sensor of a discriminating unit to one or more output receptacles, the discriminating unit determining the denomination of passing bills;

incrementing an appropriate counter when the discriminating unit determines the denomination of a bill;

suspending the feeding when the discriminating unit fails to determine the denomination of a bill with the bill

whose denomination the discriminating unit failed to determine being located in an output receptacle; and

after suspending the feeding either:

(a) manually using the control panel to indicate the denomination of the bill whose denomination is not determined by the discriminating unit or

(b) manually removing from the output receptacle the bill whose denomination the discriminating unit failed to determine and then using the control panel to restart the feeding without indicating the denomination of the bill whose denomination is not determined by the discriminating unit.

58. The method of claim **57** further comprising resuming feeding the bills after the denomination of the bill is indicated.

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